

In the claims:

This listing of claims will replace all prior versions and listings of claims in the application:

1 1. (canceled).

1 2. (currently amended) ~~The system of claim 1~~ A system for applying a laser beam to work  
2 pieces, comprising:

3 a laser system producing an output beam;

4 target delivery optics arranged to deliver said output beam to a target work piece;

5 a relay telescope having a telescope focal point in a beam path between the laser system  
6 and the target delivery optics which relays an image between an image location near an output of  
7 the laser system and an image location near said target delivery optics; and

8 a baffle including an opening at the telescope focal point large enough to easily pass the  
9 output beam propagating to the target, and small enough to block off angle and out of focus back  
10 reflections from the target delivery optics, wherein said laser system includes:

11 a gain medium;

12 a polarization rotator;

13 a passive polarizer;

14 a plurality of reflectors configured to define an optical path through the gain medium, the  
15 passive polarizer, and the polarization rotator;

16 a phase conjugator configured to receive a beam from the optical path after the pulse has  
17 proceeded one or more transits through the optical path, the phase conjugator further configured  
18 to return the beam with reversed phase to the optical path to proceed an equal number of transits  
19 of the optical path in an opposite direction before exiting the optical path at said passive  
20 polarizer; and

21 an intra-cavity relay telescope having a telescope focal point, between the gain medium  
22 and the passive polarizer, which is used for relaying images between the gain medium and a  
23 location near the output of the laser system.

1 3. (canceled).

1 4. (previously presented) A system for applying a laser beam to work pieces, comprising:  
2 a laser system producing an output beam;  
3 target delivery optics arranged to deliver said output beam to a target work piece;  
4 a relay telescope having a telescope focal point in a beam path between the laser system  
5 and the target delivery optics which relays an image between an image location near an output of  
6 the laser system and an image location near said target delivery optics; and  
7 a baffle having an opening at the telescope focal point and the output beam has a spot  
8 size at the opening, wherein; said baffle comprises a tapered baffle with surface which tapers  
9 away from the opening in at least one direction, and said surface has a length that is at least 10  
10 times the spot size at the opening.

1 5. (previously presented) A system for applying a laser beam to work pieces, comprising:  
2 a laser system producing an output beam;  
3 target delivery optics arranged to deliver said output beam to a target work piece;  
4 a relay telescope having a telescope focal point in a beam path between the laser system  
5 and the target delivery optics which relays an image between an image location near an output of  
6 the laser system and an image location near said target delivery optics; and  
7 a baffle at the telescope focal point wherein, said relay telescope comprises:  
8 a first relay lens;  
9 a second relay lens;  
10 a vacuum chamber between the first and second relay lenses, the first and second relay  
11 lenses focusing beams at the telescope focal point within the vacuum chamber;  
12 a mount within the vacuum chamber, adapted to secure the baffle near the telescope  
13 focal point;  
14 a view port on the vacuum chamber providing a view of the baffle for alignment; and  
15 an access port on the vacuum chamber, adapted for insertion and removal of the beam baffle.

1 6. (previously presented) A system for applying a laser beam to work pieces, comprising:  
2 a laser system producing an output beam;  
3 target delivery optics arranged to deliver said output beam to a target work piece;

4 a relay telescope having a telescope focal point in a beam path between the laser system  
5 and the target delivery optics which relays an image between an image location near an output of  
6 the laser system and an image location near said target delivery optics; and

7 a baffle at the telescope focal point wherein said output beam comprises pulses having a  
8 pulse width of less than 30 nanoseconds and energy greater than 10 joules/pulse on the target  
9 work piece.

1 7. (previously presented) A system for applying a laser beam to work pieces, comprising:

2 a laser system producing an output beam;

3 target delivery optics arranged to deliver said output beam to a target work piece;

4 a relay telescope having a telescope focal point in a beam path between the laser system  
5 and the target delivery optics which relays an image between an image location near an output of  
6 the laser system and an image location near said target delivery optics; and

7 a baffle at the telescope focal point, wherein said laser system includes:

8 a gain medium;

9 a polarization rotator;

10 a passive polarizer;

11 a plurality of reflectors configured to define an optical path through the gain medium, the  
12 passive polarizer, and the polarization rotator; and

13 a phase conjugator configured to receive a beam from the optical path after the pulse has  
14 proceeded one or more transits through the optical path, the phase conjugator further configured  
15 to return the beam with reversed phase to the optical path to proceed an equal number of transits  
16 of the optical path in an opposite direction before exiting the optical path at said passive  
17 polarizer;

18 a first intra-cavity relay telescope having a first intra-cavity telescope focal point,  
19 between the gain medium and the passive polarizer, which is used for relaying images between  
20 the gain medium and a location near the output of the laser system, including a first intra-cavity  
21 baffle near the telescope focal point; and

22 a second intra-cavity relay telescope having a second intra-cavity telescope focal point,  
23 between the passive polarizer and the phase conjugator, which is used for relaying images of an  
24 output of the gain medium between a location near the passive polarizer and a location at the

25 phase conjugator, including a second intra-cavity baffle near the second intra-cavity telescope  
26 focal point.

1 8. (previously presented) A system for laser shock peening work pieces, comprising:  
2 a laser system producing an output beam comprising pulses;  
3 a work piece robot cell, which positions work pieces to receive the output beam and  
4 conditions the work pieces for laser shock peening;  
5 target delivery optics arranged to deliver said output beam to a target work piece;  
6 a relay telescope having a telescope focal point, in a beam path between the laser system  
7 and the target delivery optics, which relays an image between an image location near an output  
8 of the laser system and an image location near said target delivery optics; and  
9 a baffle including an opening at the telescope focal point large enough to easily pass the  
10 output beam propagating to the target, and small enough to block off angle and out of focus back  
11 reflections from one or both of the target delivery optics and the work piece robot cell.

1 9. (original) The system of claim 8, wherein said laser system includes:  
2 a gain medium;  
3 a polarization rotator;  
4 a passive polarizer;  
5 a plurality of reflectors configured to define an optical path through the gain medium, the  
6 passive polarizer, and the polarization rotator; and  
7 a phase conjugator configured to receive a beam from the optical path after the pulse has  
8 proceeded one or more transits through the optical path, the phase conjugator further configured  
9 to return the beam with reversed phase to the optical path to proceed an equal number of transits  
10 of the optical path in an opposite direction before exiting the optical path at said passive  
11 polarizer; and  
12 an intra-cavity relay telescope having a telescope focal point, between the gain medium  
13 and the passive polarizer, which is used for relaying images between the gain medium and a  
14 location near the output of the laser system.

1 10. (original) The system of claim 8, wherein said baffle comprises a pinhole baffle.

1 11. (previously presented) A system for laser shock peening work pieces, comprising:  
2 a laser system producing an output beam comprising pulses;  
3 a work piece robot cell, which positions work pieces to receive the output beam and  
4 conditions the work pieces for laser shock peening;  
5 target delivery optics arranged to deliver said output beam to a target work piece;  
6 a relay telescope having a telescope focal point, in a beam path between the laser system  
7 and the target delivery optics, which relays an image between an image location near an output  
8 of the laser system and an image location near said target delivery optics; and  
9 a baffle having an opening having a width at the telescope focal point to block off angle  
10 and out of focus back reflections from one or both of the target delivery optics and the work  
11 piece robot cell, wherein said baffle comprises a tapered baffle with a surface which tapers away  
12 from the opening in at least one direction, and said surface has a length between 10 and 100  
13 times the width of the opening.

1 12. (previously presented) A system for laser shock peening work pieces, comprising:  
2 a laser system producing an output beam comprising pulses;  
3 a work piece robot cell, which positions work pieces to receive the output beam and  
4 conditions the work pieces for laser shock peening;  
5 target delivery optics arranged to deliver said output beam to a target work piece;  
6 a relay telescope having a telescope focal point, in a beam path between the laser system  
7 and the target delivery optics, which relays an image between an image location near an output  
8 of the laser system and an image location near said target delivery optics; and  
9 a baffle at the telescope focal point to block off angle and out of focus back reflections  
10 from one or both of the target delivery optics and the work piece robot cell, wherein said relay  
11 telescope comprises:  
12 a first relay lens;  
13 a second relay lens;  
14 a vacuum chamber between the first and second relay lenses, the first and second relay  
15 lenses focusing beams at the telescope focal point within the vacuum chamber;  
16 a mount within the vacuum chamber, adapted to secure the baffle near the telescope  
17 focal point;

18 a view port on the vacuum chamber providing a view of the baffle for alignment; and  
19 an access port on the vacuum chamber, adapted for insertion and removal of the beam baffle.

1 13. (original) The system of claim 8, wherein said output beam comprises pulses having a pulse  
2 width of less than 30 nanoseconds and energy greater than 10 joules/pulse on the target work  
3 piece.

1 14. (previously presented) A system for laser shock peening work pieces, comprising:  
2 a laser system producing an output beam comprising pulses;  
3 a work piece robot cell, which positions work pieces to receive the output beam and  
4 conditions the work pieces for laser shock peening;  
5 target delivery optics arranged to deliver said output beam to a target work piece;  
6 a relay telescope having a telescope focal point, in a beam path between the laser system  
7 and the target delivery optics, which relays an image between an image location near an output  
8 of the laser system and an image location near said target delivery optics; and  
9 a baffle at the telescope focal point to block off angle and out of focus back reflections  
10 from one or both of the target delivery optics and the work piece robot cell, wherein said laser  
11 system includes:  
12 a gain medium;  
13 a polarization rotator;  
14 a passive polarizer;  
15 a plurality of reflectors configured to define an optical path through the gain medium, the  
16 passive polarizer, and the polarization rotator; and  
17 a phase conjugator configured to receive a beam from the optical path after the pulse has  
18 proceeded one or more transits through the optical path, the phase conjugator further configured  
19 to return the beam with reversed phase to the optical path to proceed an equal number of transits  
20 of the optical path in an opposite direction before exiting the optical path at said passive  
21 polarizer;  
22 a first intra-cavity relay telescope having a first intra-cavity telescope focal point,  
23 between the gain medium and the passive polarizer, which is used for relaying images between

24 the gain medium and a location near the output of the laser system, including a first intra-cavity  
25 baffle near the telescope focal point; and  
26 a second intra-cavity relay telescope having a second intra-cavity telescope focal point,  
27 between the passive polarizer and the phase conjugator, which is used for relaying images of an  
28 output of the gain medium between a location near the passive polarizer and a location at the  
29 phase conjugator, including a second intra-cavity baffle near the second intra-cavity telescope  
30 focal point.

1 15. (original) A method for laser shock peening a target work piece, comprising:  
2 coupling a seed pulse into a ring shaped optical path including an amplifying medium;  
3 first relaying an image of an output of the amplifying medium to SBS phase conjugation  
4 system;  
5 phase reversing the pulse in the SBS phase conjugation system after one or more transits  
6 through the ring in which the pulse traverses the amplifying medium;  
7 second relaying an image of the output of the amplifying medium to an output coupler,  
8 after the pulse traverses the amplifying medium in an equal number of transits through the ring in  
9 an opposite direction to provide a wavefront corrected output pulse;  
10 coupling the wavefront corrected output pulse comprising the image of the output of the  
11 amplifying medium out of the ring at the output coupler, and  
12 controlling a pulse width of the wavefront corrected output pulse by controlling a  
13 threshold of said SBS phase conjugation system;  
14 third relaying an image of the wavefront corrected output pulse via a relay telescope to  
15 target delivery optics;  
16 delivering the wavefront corrected output pulse to the target work piece; and  
17 blocking back reflections using a baffle in the relay telescope.

1 16. (original) The method of claim 15, wherein said SBS phase conjugation system comprises a  
2 collimated SBS cell and a focused SBS cell in the cavity.

1 17. (original) The method of claim 15, wherein said SBS phase conjugation system comprises a  
2 collimated SBS cell and a focused SBS cell in the cavity, and said controlling the pulse width

3 includes diverting a controlled amount of energy from said pulse out of the cavity between the  
4 collimated SBS cell and the focused SBS cell to control said threshold.

1 18. (original) The method of claim 15, wherein said SBS phase conjugation system includes an  
2 SBS medium in said cavity, the SBS medium comprising a compound having a non-linear  
3 index of refraction of less than about  $10^{-12}$  esu.

1 19. (original) The method of claim 15, wherein said SBS phase conjugation system includes an  
2 SBS medium in said cavity, and including filtering said SBS medium *in situ* to remove particles  
3 having a size greater than about 0.1 microns.

1 20. (original) The method of claim 15, wherein said SBS phase conjugation system includes a  
2 collimated SBS cell and a focused SBS cell in the cavity; and  
3 aligning the optical cavity using an alignment fiducial between the collimated SBS cell  
4 and the focused SBS cell.

1 21. (original) The method of claim 15, wherein said first and second relaying includes using at  
2 least one relay telescope having an intra-cavity telescope focal point, having a baffle at said  
3 intra-cavity telescope focal point to block off angle beams.

1 22-24. (canceled)

///